

frequencies] by detecting a signal including reflected and/or backscattered signals generated by non-linearity in the examination area.

20. (Amended) An apparatus for ultrasonic harmonic imaging of biological tissue in an examination area comprising:

one or more ultrasonic energy generators generating an excitation frequency of from 0.3 MHZ to 22 MHZ applied to the examination area;

one or more transducers transmitting the ultrasonic energy to the examination area and detecting reflected and/or backscattered energy from the examination area; and

101 a processor [evaluating from the reflected and/or backscattered ultrasonic energy from the examination area at least one signal frequency-shifted from the excitation frequency and generating] which generates an image of biological tissue in the examination area [therefrom] from a signal, frequency-shifted from the excitation frequency, including reflected and/or backscattered signals generated by non-linearity in the examination area.

21. (Amended) An apparatus for ultrasonic harmonic imaging of biological tissue in an examination area comprising:

one or more ultrasonic energy generators generating two different excitation frequencies both of from 0.3 MHZ to 22 MHZ applied to the examination area;

one or more transducers transmitting the ultrasonic energy at both frequencies to the examination area and detecting reflected and/or backscattered energy from the examination area; and

a processor [means evaluating from the reflected and/or backscattered ultrasonic energy from the examination area a signal combination of the two excitation frequencies and generating] which generates an image of biological tissue in the examination area from a signal including reflected and/or backscattered signals generated by non-linearity in the examination area.

Claim 23, line 1, replace "31" with -- 21 --.

Claim 32, line 2, replace "being" with -- is --.

Line 3, replace "being" with -- is --.

Claim 36, line 2, replace "being" with -- is --.

Line 3, replace "being" with -- is --.

37. A system for obtaining an image of biological tissue comprising biological tissue, and in operative association therewith,

one or more ultrasonic energy generators generating excitation frequency of from 0.3 MHZ to 22 MHZ applied to [the] an examination area containing the biological tissue;

one or more transducers transmitting the ultrasonic energy to the examination area and detecting reflected and/or backscattered energy from the examination area therefrom;

[processing means for evaluating from the reflected and/or backscattered ultrasonic energy from the examination area at least one harmonic of the excitation frequency and for generating an image of biological tissue in the examination area] a processor which generates an image of the biological tissue in the examination area from a signal including reflected and/or backscattered signals generated by non-linearity in the examination area.

38. A system for obtaining an image of biological tissue comprising biological tissue, and in operative association therewith,

one or more ultrasonic energy generators generating two different excitation frequencies both of from 0.3 MHZ to 22 MHZ applied to an [the] examination area containing the biological tissue;

one or more transducers transmitting the ultrasonic energy at both frequencies to the examination area and detecting reflected and/or backscattered energy from the examination area;

a processor [evaluating from the reflected and/or backscattered ultrasonic energy from the examination area a signal combination of the two excitation frequencies and generating an image of biological tissue in the examination area therefrom] which generates an image of the biological tissue in the examination area from a signal including reflected and/or backscattered signals generated by non-linearity in the examination area.

Add the following new claims:

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-15 42. The process of claim 18, wherein the examination area imaged is biological tissue.

¹
7 43. The process of claim 19, wherein the examination area imaged is biological tissue.

¹⁴
18 44. The process of claim 39, wherein the examination area imaged is biological tissue.

19 45. A process for imaging a patient to whom an ultrasonic contrast agent has been administered, which comprises:

subjecting the patient to ultrasonic energy and imaging the patient using reflected and/or backscattered signals generated by non-linearity of the contrast agent.

¹⁹
20 46. The process of claim 45, wherein the patient is subjected to ultrasonic energy in a broad bandwidth.

²⁰
21 47. The process of claim 46, wherein the ultrasonic energy has a frequency of from 0.3 MHZ to 22 MHZ.

¹⁹
22 48. The process of claim 45, wherein the patient is a human.

¹⁹
23 49. The process of claim 45, wherein the ultrasonic contrast agent contains microbubbles or produces microbubbles upon exposure to ultrasonic energy.

¹⁹
24 50. The process according to claim 45, wherein the ultrasonic contrast agent is a solution, an emulsion or a suspension.

25 51. The process according to claim 50²⁴, wherein the contrast agent is a microbubble suspension having a concentration of from 10⁻³% by weight to 30% by weight dry substance in the suspension.

24 52. The process of claim 45¹⁹, wherein the ultrasonic energy has a frequency from 1 MHZ to 11 MHZ and 1 to 5 cycles are generated.

27 53. The process of claim 43¹⁹, wherein the reflected and backscattered ultrasonic signal is processed with a computer-controlled gate circuit, at least one time window being selected and the associated frequency spectrum being determined in analog or digital manner.

54. A system for obtaining an image of a patient's biological tissue comprising said patient, and in operative association therewith

one or more ultrasonic energy generators for generating ultrasonic energy applied to the patient's biological tissue;

one or more transducers for transmitting the ultrasonic energy to the patient's biological tissue and for detecting reflected and/or backscattered energy therefrom; and

a processor generating an image of the patient's biological tissue from the reflected and/or backscattered ultrasonic energy generated by non-linearity therein. --.

REMARKS

The Amendments

Initially, it should be noted that applicants submitted a Second Preliminary Amendment on March 9, 1999, which was filed before applicants' representative was aware that an Office Action had been issued. This amendment added claims 39-41 and was accompanied by a Submission of Formal Drawings. That amendment and the submitted drawings should be included in the next examination round along with this amendment.

The claims are amended to remove surplusage such as "frequency f_0 " when not referred to subsequently. Also they now more clearly set forth that nonlinear interactions in general underly the invention. Claim 23 is amended to correct an obvious typographical error in its